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POSTAL REGULATORY COMMISSION
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STATUTORY REVIEW OF THE SYSTEM FOR REGULATING RATES AND CLASSES FOR MARKET DOMINANT PRODUCTS	)))	Docket No. RM2017-3

SUPPLEMENTAL DECLARATION OF TIMOTHY J. BRENNAN FOR THE PUBLIC REPRESENTATIVE

(MARCH 1, 2018)

I. INTRODUCTION

My name is Timothy J. Brennan. I am Professor of Public Policy and Economics in the School of Public Policy at the University of Maryland, Baltimore County (UMBC), where I have been teaching since 1990. In January 2017, the Public Representative of the Postal Regulatory Commission ("PRC" or "the Commission") contracted with me to prepare a Declaration, filed on March 20, 2017, following a request from the Commission for comment on modifications to improve the present system of regulating market-dominant services provided by the United States Postal Service (USPS).[1] The system is a price-cap based method set out in the Postal Accountability and Enhancement Act (PAEA).[2] The main purpose of my Declaration was to propose a simple and practical method for adjusting rates for market-dominant services when demand for

[1] Declaration of Timothy J. Brennan for the Public Representative Before the Postal Regulatory Commission, *Statutory Review of the System for Regulating Rates and Classes for Market Dominant Products*, Docket No. RM2017-3 (March 20, 2017), hereafter "Declaration". The Commission's request for comment is in Ordering Paragraph 2 of Postal Regulatory Commission, *Advance Notice of Proposed Rulemaking on the Statutory Review of the System for Regulating Rates and Classes for Market Dominant Products*, Order No. 3673, Docket No. RM2017-3 (Dec. 20, 2016).

[2] H.R. 6407, P.L. 109-435 (2006).

those services falls. The purpose of the adjustment would be to maintain the financial stability of the USPS.[3]

The Commission's proposed rule overall includes a number of rate adjustments to the present system of price-cap regulation of USPS market-dominant services.[4] These include giving the USPS authority to raise rates per class of mail, per year (during 5 years) by:

- 2% to achieve medium-term financial stability, to generate revenues with a present value sufficient to cover a $2.7 billion 2017 net loss as well as expected inflation-only increases (Order 4258 at 41-42, referred to as "supplemental rate authority," *id.* at 37);
- Up to .75% if it achieves operational efficiency improvements according to total factor productivity (TFP) metrics (Order No. 4258 at 61-63, referred to as "operational efficiency-based rate authority," *id.* at 61);
- Up to .25% if USPS issues service standard criteria that meet or exceed service standards for the prior year. (Order No. 4258 at 70-72, referred to as "performance-based rate authority," *id.* at 71).[5]

[3] Objective 5 in PRC Order 3673.

[4] Postal Regulatory Commission, *Notice of Proposed Rulemaking for the System for Regulating Rates and Classes for Market Dominant Services*, Order No. 4258, Docket No. RM2017-3 (Dec. 1, 2017), hereafter "Order No. 4258".

[5] Order No. 4258 mentions, "adhering to service standard quality criteria", *id*. at 70. However, the Commission grants the .25% rate authority based solely on maintaining service standards, not explicitly on whether they are met. Subsequent discussion refers only to standards, not adherence. *Id.* at 71. The Commission says that actual performance is best monitored through Annual Compliance Determinations, so is not a factor regarding the increased rate authority proposed here, and that "the current ratemaking system has proven sufficient for purposes of holding the Postal Service accountable for its service performance. *Id.* at 72; Postal Regulatory Commission, *Order on the Findings and Determination of the 39 U.S.C. § 3622 Review*, Order No. 4257, Docket No. RM2017-3 (Dec. 1, 2017) at 264.

- Up to 2% for non-compensatory classes of service, that is, those that do not cover attributable costs (Order No.4258 at 84-86).[6]

Although the Commission recognized the effect of declining demand on revenues (Order No. 4258 at 42), none of these adjustments would be tied to the amount of the decline in demand, either annually or as part of subsequent price-cap reviews. The Commission proposes that such reviews would take place after the 2% supplemental authority expires, five years after the proposals in this Order would go into effect (Order No.4258 at 37).

Consequently, the Public Representative of the Postal Regulatory Commission has asked me to provide some clarifications and additions to my prior Declaration that will provide additional explanations of my proposed method for adjusting rates to compensate for declining demand. I will begin by characterizing my adjustment proposal directly in terms of the ratio of the contribution to institutional cost to revenue (contribution to revenue ratio), as I used in my example, rather than beginning with the jargon-laden "elasticity of average cost".[7] The Public Representative has also requested that I provide sample calculations for four classes of market dominant products: First Class mail, Marketing (former Standard) mail, Periodicals, and Package Services.[8] I will conclude with some observations on implementation, specifically measurement of

[6] The Commission also proposed changes to ensure that workshare discounts equal avoided costs to the USPS from worksharing. Order No. 4258 *supra* n. 4 at 88-90.

[7] My earlier Declaration includes demonstrations showing that contributions to cover institutional costs is a reasonable approximation to the elasticity of average cost, and that elasticity of average cost is the particular piece of information one needs to adjust rates when demand falls so that the decline would leave USPS's solvency unaffected. The approach here does not differ in content, but in presentation. Readers wanting detail on these relationships can find them in the earlier Declaration.

I also note that the term "contribution to institutional cost" refers to a contribution toward covering institutional costs not otherwise attributed to a service or class of services.

[8] My earlier Declaration provided only an illustrative calculation based on an average of the major market dominant products, finding that an average adjustment of only 1.3% over the period from 2006 to 2015 to show that including an adjustment would not involve economically catastrophic changes in price. Brennan Declaration, *supra* n. 1 at 19-20.

declining demand and the usefulness of incorporating annual adjustments when caps themselves would be reviewed after five years, as the Commission has proposed.

II. ADJUSTING PRICE CAPS FOR DECLINING DEMAND

My earlier Declaration presented the basic economics for adjusting price caps for declining demand to preserve USPS solvency, neither enhancing nor degrading it. The Public Representative has asked me to present the adjustment method more simply and directly. Fortunately, I believe this can be done, and Appendix A shows how to do it. The simple expression says that the percent the price cap should be increased is the percentage reduction in volume times the contribution to revenue ratio.[9] If we let $\frac{C}{R}$ symbolize this ratio, we can express this basic adjustment as a formula:

$$\%\Delta P = [\%\Delta V]\,\frac{C}{R}.$$[10]

This expression slightly understates the adjustment necessary. Its derivation assumes that increasing the price cap itself has no effect on volumes, when in practice it will. For that reason, the formula needs to be adjusted to include that additional induced loss in demand. To do so, we

[9] The percentage change in volume is measured relative to the end year as a baseline, to make the derivation of the formula easier. *See* Appendix A.

If a service fails to cover its attributable cost, that is, is "non-compensatory" as in PRC Order No. 4258, it is failing to make any contribution to institutional cost; if anything, it is taking funds away from the institution. In fact, if volumes for that service falls, that service will drain less from the institution, making USPS more solvent. The Commission is correct in Order No. 4258 to treat these services differently and allow them to increase price at least to per unit attributable cost.

[10] This expression is the one at the top of Brennan Declaration, *supra* n. 1 at 18, assuming the elasticity of demand is zero.

need to incorporate the elasticity of demand into the adjustment. The derivation of this "adjustment to the adjustment" is slightly more complicated; Appendix B describes how to do so.[11] The price adjustment above should be "divided" by one minus the contribution to revenue ratio times the elasticity of demand (in absolute value).[12] If we let $|E_D|$ stand for the absolute value of the elasticity of demand (to represent it as a positive number), the adjustment becomes

$$\%\Delta P = \%\Delta V \frac{C/R}{1 - [C/R]|E_D|} .$$

If the contribution is positive, then the contribution to revenue ratio times the absolute value of elasticity is also positive. This makes the denominator less than one, implying that taking elasticity of demand into account leads to a greater price increase. The intuition is that when one compensates for reduced volumes by raising price, one has to raise price more to keep the contribution constant because of the effect of raising price on demand.[13]

[11] This adjustment is based on the derivation in Brennan, T. and M. Crew, "Price Cap Regulation and Declining Demand," in Crew, M. and T. Brennan (eds.), *The Future of the Postal Sector in a Digital World* (New York: Springer, 2016): 1-17, especially at 9, 15-16.

[12] The elasticity of demand is the measure of how much volumes change, as a percentage, from a percentage change in the price.

[13] One may ask whether this process of raising price to compensate for the effect of raising price always has an ending. It will, according to the formula, as long as the denominator in that expression, $1 - [C/R]|E_D|$, is positive. This will not be the case if the elasticity of demand is sufficiently large in absolute value, that is,

$$|E_D| > 1/[C/R].$$

If this holds, raising price brings about so great a reduction in demand that the service cannot maintain the level of contribution it made prior to the decline in demand unrelated to the price of the service.

One qualification, noted in my earlier Declaration,[14] merits highlighting here, following the Commission's recent order regarding proposed changes to costing methodologies.[15] The formula here takes average attributable cost to be a reasonable proxy for marginal cost. (Appendix A shows this.) Although Order No. 3506 said that attributable cost should be based on incremental cost,[16] the discussion indicated possibilities that average attributable cost, or average incremental cost, could be above or below marginal cost. If incremental cost includes substantial fixed cost, marginal cost could be below average attributable cost. If there are inframarginal costs, or if institutional costs include costs that could be attributed to a particular service, marginal cost could be above average incremental or attributable cost.

If marginal cost is below average attributable cost, such as if attributable or incremental cost includes fixed costs, then the amount of contribution to institutional cost lost by USPS when demand falls could be larger than when measured by attributable cost. If so, the price adjustment should be larger. Conversely, if marginal cost is above average attributable or incremental cost, the contribution USPS loses when demand falls could be less than if average attributable cost is a proxy for marginal cost. If so, the price adjustment should be smaller.

If those charged with implementing this price adjustment know marginal cost sufficiently well to not have to use average attributable or incremental cost as a proxy, they should do so di-

[14] Brennan Declaration, *supra* n. 1 at 21-23.

[15] Postal Regulatory Commission, Order Concerning United Parcel Service, Inc.'s Proposed Changes to Postal Service Costing Methodologies, *Periodic Reporting*, Order No. 3506, Docket No. RM2016-2 (Oct. 19, 2016), hereafter PRC Order No. 3506.

[16] *Id*. at 60, 123-124.

rectly by using the price-cost margin, $\frac{P - MC}{P}$, instead of the contribution to revenue ratio, $\frac{C}{R}$, whenever the latter appears in the formulas above. As shown in Appendix A, $\frac{C}{R}$ is nothing more than a convenient proxy for $\frac{P - MC}{P}$ based on the data likely to be most readily available.

III. EXAMPLES OF PRICE ADJUSTMENTS BY MAIL CLASS

To illustrate how the adjustment formula would work, my earlier Declaration included a calculated average price adjustment for USPS based upon the three largest USPS services by revenue: First-Class Single-Piece Letters, First-Class Presort Letters, and Standard regular letters. It has always been my intent and expectation that the Commission would use the formula to calculate adjustments for specific classes and services as it deems appropriate, with the data it believes to be the best available. For this supplemental declaration, the Public Representative has asked me to provide a more detailed illustration by calculating adjustments for four classes of mail: First-Class, Marketing (formerly Standard) Mail, Periodicals, and Package Services.

At my request, the Public Representative has supplied me with data on contributions to institutional costs, revenues, and average demand elasticities for each of these classes for 2017. The PRC staff has also supplied me with volumes for 2017 and estimated volumes for 2018, so I can calculate changes in volumes for all of these classes. With those data, I calculate the following table of price adjustments: [17]

[17] Dr. Lyudmila Y. Bzhilyanskaya of the Public Representative staff supplied these data to me. She reported to me that her sources were as follows: Volumes for FY 2017: FY 2017 ACR, Library Reference USPS-LR-FY17/1, file PublicFY17CRAReport.xlsx, worksheet "Volume1"; Volumes for FY 2018: Postal Service Econometric Estimates of Demand Elasticity for All Postal products, FY 2017, January 19, 2018, file vf-Jan2018(md).xlsx, worksheet "Forecast Vols". Revenue and Attributable Cost are from FY 2017 ACR, USPS-LR-FY17/1, file PublicFY17CRAReport.xlsx, worksheet "Cost1". Weighted class-level elasticities were calculated using data from

Class of Market Dominant Mail	First Class	Marketing	Periodicals	Package Services
FY2017 Volume (Thousand Pieces)	59,490,507	78,369,843	5,300,745	619,888
(Estimated) FY2018 Volume (Thousand Pieces)	56,228,525	76,702,439	5,062,760	644,783
2017 – 2018 Volume Change (ΔV, Thousand Pieces)	3,261,982	1,667,404	237,986	(24,894)
% Volume Change (%ΔV)[18]	**5.8%**	**2.2%**	**4.7%**	**-3.9%**
Revenue ($ Million)	26,708	16,672	1,375	801
Attributable Cost ($ Million)	12,711	10,918	1,983	773
Contribution (Rev. - Att. Cost)	13,997	5,754	-608	28
Contribution/Revenue ratio (C/R)	**0.524**	**0.345**	**-0.442**	**0.035**
Elasticity of Demand (E_D)	**-0.321**	**-0.558**	**-0.195**	**-0.802**
Price Adjustment (%ΔP)	**3.65%**	**0.93%**	**N/A**	**-0.14%**

The boldface rows reflect the terms in the formula for calculating price adjustments; the other data were used in the calculation of these terms.

The price adjustment would be most significant and upward for First Class mail. The calculated adjustment is about 3.85%. This is primarily because the volume decline is fairly substantial—5.8% relative to FY2018 volume—and that over half of revenue, 52.4%, goes to cover institutional cost. The price adjustment for marketing mail would be less than 1% because the volume change is much smaller, 2.2%, and only about a third of revenue, 34.5%, goes to cover institutional cost.

Postal Service Econometric Estimates of Demand Elasticity for All Postal products, FY 2017, January 19, 2018, file vf-Jan2018(md).xlsx, worksheet "Forecast Vols" and "Elasts."

[18] Recall that the percentage change in volume is measured relative to the end of fiscal year, here FY2018.

The "N/A" is in the price adjustment results for Periodicals because Periodicals is a "non-compensatory" class as defined in Order No. 4258, that is, that a class where revenue fails to cover attributable cost.[19] When a class or service fails to cover attributable cost, it is failing to make any contribution toward the institutional cost; rather, it is taking funds away from the institution. If volume for that service falls, that service will drain less from the institution, making USPS more solvent. The Commission is correct in Order No. 4258 to treat these services differently and allow them to increase price so that revenues at least cover attributable cost. For that reason, I do not provide here illustrative price effects for the Periodical class. [20]

This recent estimate shows an increase rather than decrease in volume for Package Services. The formula can still be applied in that case, prescribing a cut in price rather than an increase in price. That price cut would be small because, according to the data, the contribution to cover institutional costs from Package Services class are quite small, only about 3.5% of revenue. However, the direction of this effect shows that the mirror image of the intuition behind this price adjustment formula holds: If demand for a class or service goes up, the contribution to institutional cost will go up, so the goal of keeping that contribution constant would be served by cutting price.

[19] Order No. 4258, *supra* n. 4 at 73.

[20] In principle, the formula would still apply as a technical matter. If the net contribution is negative, the term on the right, involving C/R, will be negative as well. This says that if volume falls, the net contribution goes up, because the firm is losing less money on that service. If one wants to hold that contribution constant, one would want to make it more negative, which would entail cutting price to that service. While the mathematics here remain correct in principle, cutting prices on services that fail to cover attributable cost in general will not be efficient and will entail greater subsidies of those losses through contributions from other services with positive contributions.

IV. COMMENTS AND QUALIFICATIONS

The above discussion highlighted a few assumptions used to make this price adjustment formula operational. One in particular is that if the Commission or USPS has direct data on marginal cost, it should use the price-cost margin in the formula directly rather than apply the contribution to revenue ratio as an estimate. Another assumption is that the formula is not appropriate for non-compensatory services that add to institutional costs rather than contribute to cover them. Generally, the price of such services should be adjusted upward so that they cover their attributable cost, at least those that are variable. As the Commission further considers this approach to dealing with the effect of declining demand on the fiscal stability of USPS, a few other points should be kept in mind.

Taking contributions as given. The price adjustment formula here is designed to achieve only one goal—to maintain the ability of a service or class of services to make a given contribution to cover institutional cost. It is not designed to address the question of whether a given contribution to institutional cost is appropriate, and that subject is beyond the scope of my declarations. I want only to observe that were this formula to lead to a price increase that the PRC finds undesirable, the Commission might consider reducing the contribution that this service or class would make to cover institutional costs.

Services within classes. The Public Representative has asked me to calculate price adjustments for four classes of service: First-Class mail, Marketing (Standard) mail, Periodicals, and Package Services. The formula produces price adjustments per class that would preserve the total contribution to cover institutional cost. It may well be that some services within a class are

non-compensatory. Modifying the calculation, for example, by assuming that the price of a non-compensatory service is raised so the service covers its incremental cost and reducing the contribution required from the remaining services in that class, is outside the scope of this proceeding.

Symmetry. As the Package Services example illustrates, the formula works for increases in demand as well as decreases in demand. If volumes increase, the formula prescribes a reduction in price. When volumes increase, the contribution to cover institutional cost increases. As a consequence, USPS could cut price for that service and maintain the same contribution, in effect allowing all customers to share in the gains resulting from an increase in demand. In choosing whether and how to implement the price adjustment formula, the Commission should keep in mind that the street is two-way—it is not a recipe for only increases in prices.

Demand and quality. As noted in my earlier Declaration, the change in demand in the formula should be the change resulting from factors outside the control of USPS, such as the growth of electronic communication. It should not include declines in demand based on changes in the quality of the service that USPS provides. Otherwise, USPS would be insulated from the consequences of reducing quality, as the prices would adjust to maintain the same contribution to cover institutional cost from that service.[21] If service quality falls over time, particularly from one year to the next (if the formula were used to calculate price adjustments on an annual basis), the effect of that on demand should be removed. How the Commission should value changes in quality to recognize such effects is outside the scope of this Declaration. However, as noted

[21] Brennan Declaration, *supra* n. 1 at 15, 21.

above, in Order No. 4258 the Commission expressed confidence that it could monitor and preserve service quality through Annual Compliance Determinations.[22] If so, the formula can be applied with confidence that changes in volumes are due to outside factors rather than USPS performance.

Frequency of review. In Order No. 4258, the Commission noted its preference for reviewing the performance of USPS under price caps after five years, expressing the need to balance preventing windfalls or risk insolvency arising from less frequent reviews with reducing efficiency incentives arising when reviews are more frequent.[23] One might then ask whether the formula could be applied during each of those reviews, or whether it is even necessary since the Commission could readjust USPS prices, calculations of attributable and institutional costs, and per service or per class contributions to cover institutional costs at those times. The Commission, however, in this order also expressed a preference to spread out price adjustments rather than have potentially large ones.[24] An advantage of applying the price adjustment formula proposed here is that it allows for the spreading out of price increases due to falling demand rather than impose a relatively large increase every five years or however frequently the Commission deems reviews to be useful. Moreover, this adjustment is not a simple proration but would be based on volume declines in any given year, adding stability to USPS's financial position in between reviews.

[22] *Supra* n. 5.

[23] Order No. 4258, *supra* n. 4 at 37.

[24] *Id.* at 45.

APPENDIX A: The Basic Price Cap Adjustment.

Some notation is still required, but I hope this approach makes the method more transparent and potentially useful. We begin by observing that a decline in volume for a particular service reduces USPS solvency, which I take here to be contribution to institutional cost. For each unit of lost volume, this contribution falls by the difference between the price cap—money coming in—and the attributable cost associated that unit—money going out. If we let P be the price cap for this service and MC ("marginal cost") be that per unit attributable cost for this service, this per unit loss in revenue is just

$$\text{Per unit loss in contribution to institutional cost} = P - MC.^{25}$$

Let ΔV be the decline in volume for a particular USPS service, that is,

$$\Delta V = V_{before} - V_{after},$$

where "before" and "after" refer to the times between which the decline was measured. One can thing of "before" as "last year" and "after" as "this year". With ΔV defined, the total loss in contribution to institutional cost becomes

$$\text{Total loss in contribution to institutional cost} = \Delta V[P - MC].$$

An increase in the price cap, which we can label ΔP needs to recover this reduction in the contribution to institutional cost. That increase in contribution from the increase in price would be

$$\text{Increase in contribution from adjusting the price cap} = \Delta P * V_{after}.$$

To maintain USPS solvency, this increase in contribution from raising the price has to equal the loss in contribution from the decline in volumes.

$$\Delta P * V_{after} = \Delta V[P - MC].^{26}$$

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[25] For simplicity in actual calculation, we measure MC as the average attributable cost per unit. I used this measure in my earlier Declaration.

[26] This expression and the derivation below reflect an assumption that the volume decline is not exacerbated by raising the price. If it is—and we would expect some effect or, to put it in economic terms, that elasticity of demand is not zero—the formula should be adjusted to give a more precise estimate. That adjustment, unfortunately, does

Accordingly, the amount the price cap should increase is given by

$$\Delta P = \frac{\Delta V}{V_{after}} [P - MC].$$

The expression $\frac{\Delta V}{V_{after}}$ is the percentage decrease in demand, measured relative to the demand after the decline in volume. Label that as "%ΔV".

It also turns out to be useful to do two other things to this expression. First, divide both sides by the price cap P, giving

$$\frac{\Delta P}{P} = [\%\Delta V] \left[\frac{P - MC}{P}\right].$$

As we did with volume, let "%ΔP" = $\frac{\Delta P}{P}$, the percentage adjustment in the price cap because of declining demand. To turn this into something useful, multiply both the numerator and denominator of the expression in the brackets on the right by V_{before}. This will give

$$\%\Delta P = [\%\Delta V]\left[\frac{P*V_{before} - MC*V_{before}}{P*V_{before}}\right].$$

$P*V_{before}$ is just the revenue that service had been bringing in, and by the way we defined it, $MC*V_{before}$ is just attributable cost. The denominator in the expression in the brackets is just the revenue the service was bringing in, and the numerator is just the difference between revenue and attributable cost for that service, or in other words, its contribution to institutional cost. This gives us the simple, direct expression for the price cap adjustment:

$$\%\Delta P = [\%\Delta V]\left[\frac{\text{Contribution to institutional cost}}{\text{Revenue}}\right].$$

In other words, the percent the price cap should be increased is the percentage reduction in volume times the contribution to revenue ratio. If we let "C/R" stand for the contribution to revenue ratio, we get the expression in the text.

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not lend itself to as direct a derivation as that given here for the basic adjustment formula. The text of this supplemental declaration describes that adjustment.

APPENDIX B: Adjusting for Price Elasticity of Demand

The above derivation for adjusting price in response to declining demand implicitly includes an assumption that raising price does not affect volume. That is typically not the case. To improve the estimate, we need to ensure that the price adjustment is sufficiently large to cover this induced change in volume. Let $\%\Delta V_{induced}$ refer to the percentage change in volume that arises because of the percentage change in price $\%\Delta P$. Modifying the formula implies

$$\%\Delta P = [\%\Delta V + \%\Delta V_{induced}]\left[\frac{\text{Contribution to institutional cost}}{\text{Revenue}}\right].$$

By definition, the absolute value of elasticity $|E_D|$ equals the percentage change in volume induced by a percentage change in price, when both are measured as positive numbers. That is,

$$|E_D| = \frac{\%\Delta V_{induced}}{\%\Delta P}.$$

Because of that definition, we can substitute $|E_D|[\%\Delta P]$ for $\%\Delta V_{induced}$ in the above expression to get

$$\%\Delta P = [\%\Delta V + |E_D|[\%\Delta P]]\left[\frac{\text{Contribution to institutional cost}}{\text{Revenue}}\right].$$

Using $\frac{C}{R}$ as the expression of contribution to revenue ratio and collecting the terms with the percentage change in price on one side of the relationship gives

$$[\%\Delta P][1 - |E_D|\tfrac{C}{R}] = [\%\Delta V]\,\tfrac{C}{R}.$$

Dividing both sides by $[1 - |E_D|\frac{C}{R}]$ gives the formula in the text.

VERIFICATION

I, Timothy J. Brennan, declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed on March 1, 2018.

Timothy J. Brennan